BULLOCK

A design for a university gymnasium

Architecture

B. S.

1910

A DESIGN FOR A UNIVERSITY GYMNASIUM

BY

EDWIN CORLIES ATLEE BULLOCK

THESIS

FOR THE

DEGREE OF BACHELOR OF SCIENCE

IN

ARCHITECTURE

COLLEGE OF ENGINEERING

UNIVERSITY OF ILLINOIS

1910

UNIVERSITY OF ILLINOIS

June 1 1910

THIS IS TO CERTIFY THAT THE THESIS PREPARED UNDER MY SUPERVISION BY

EDWIN CORLIES ATLEE HULLOCK

ENTITLED A DESIGN FOR A UNIVERSITY GMYNASIUM.

IS APPROVED BY ME AS FULFILLING THIS PART OF THE REQUIREMENTS FOR THE

DEGREE OF BACHELOR OF SCIENCE IN

ARCHITECTURE.

John Watrous Gane.
Instructor in Charge

APPROVED: N. Clifford Ricker

HEAD OF DEPARTMENT OF Architecture.

INDEX.

DESIGN FOR A UNIVERSITY GYMNASIUM.

The University, combines with its scheme of educational gymnastics, free recreative work and athletics. It is with the latter that we are apt to find conflict with gymnasium work and each branch will have different times to work. In most University preparatory schools as well as high schools, gymnasium work is part of the course and is compulsory. Athletics, while voluntary form an important factor of student life, and no other department of the institution is so effective in promoting the spirit of the student body of to-day. Every effort should be made to properly care for and develop these men who are willing to give their time, to represent the institution and students in this way. Very few students indulge to any extent in indoor athletics but their physical training comes in what is known as regular gymnasium work and the welfare of the majority should be well cared for. The majority of gymnasiums planned to-day are not large enough for the gymnasium work demanded. The added feature of athletics emphasize the need for more space, and it is reasonable to suppose that time will increase it as both physical training and indoor athletics are becoming more and more a factor in educational life.

The most practical scheme that has been advanced so far is the separation of the two features. This is especially true in college work. One of the newest gymnasiums that has been completed lately has a gymnasium floor of approximately 70 x 100 feet, and in connection an indoor athletic field 140 feet wide and 190 feet long with banked track and dirt floors. There is a state normal school which has separate floors for gymnastics and athletic work.

The building is approximately 210 feet long by 70 feet wide. The lower room has a ceiling height of 17 feet and the trusses in the upper room are about 20 feet from the floor. The indoor games may be played on the lower floor which is free from apparatus while the upper floor is devoted to gymnastics. Such arrangements create ideal conditions as one department does not interfere with the other. Many directors of gymnastics and athletics object to this scheme because of the fact that so few schools have these factors and when engaged in dual meets on the visitor's floors the athletes who are used to the dirt floor and track are handicapped.

The estimated amount of space required per person in drill or mass work is placed varyingly from 35 to 50 square feet. The architect should not go below a certain minimum and congestion must be avoided if he is to make his plant adequate to its needs. It would be safe to estimate on the larger number of square feet given above in applying this rule for class work in gymnasiums is constantly expanding.

One authority states that after a gymnasium has reached a width of 80 feet and a length of 160 feet, being in the ratio of two to three, the additional area may be best added by making the hall longer. This is particularly good when athletics and gymnastics are combined, as different work may be carried on at opposite ends of the hall at the same time. If a running track, from eight to ten feet wide, be installed, it establishes a suitable width for basket-ball, which is the most popular of gymnasium games and three courts may be comfortably provided for. From the athletic standpoint it would offer opportunity for 60 yard dashes and give a longer "straight away" on the track, and allow generally for a better arrangements of events.

Following is a typical equipment for a gymnasium:-Twenty-four chest machines, twenty-four bar stalls, twenty-four stalls, twenty-four stall benches,six vaulting horses, six vaulting bucks, six parallel bars, six pairs of jumping standards, twelve jump boards, six horizontal and vaulting bars, twelve climbing ropes, six pairs of flying rings, ten traveling rings, one inclined board, six spring boards, six adjustable ladders, mattresses, three pairs of basket ball backstops.

Figure 6, illustrates a gymnasium of the size specified above. The apparatus as shown is to be used collectively by "squads" or classes". Classes are subdivided into "units" and the average working "units" on most apparatus is six.

It is desirable to preserve this working unit of six in providing individual pieces, such as chest-weights and bar stalls. Chest machines scale five feet on center and bar stalls three feet.

The latter are best installed in one section without interslices between up-rights and wall space should be provided accordingly. Architects may save expense and produce better results if they provide wall boards when the gymnasium is constructed. They should be four feet ten inches high on center for chest weights, and seven feet nine inches high on center for bar stalls. Boards should be six inches wide, one and seven-eights inches thick, and stained to match woodwork.

The average gymnasium will probably seldom rum classes of over seventy-five, and from that down to thirty or forty. In planning a room it is best to base figures on the larger number. Floor space and air space are both desirable. Applying 50 square feet, per person, the room should contain 3,750 square feet, for a class of seventy-five, (75) and of the proportions generally to be recom-

mended, measure 50 feet by 75 feet.

Posts in some cases are necessary in building construction, but they are objectionable from the gymnasium standpoint. They cut up the floor space and must be padded to lessen chances of injury in basket-ball games, etc.

Office, dressing room, and examining room for the physical director should be on the floor with gymnasium. It is desirable to have the director so placed that he can view the gymnasium floor. In the larger gymnasiums they have a medical director with one or more floor directors, the office for the latter only may be placed to view the gymnasium floor, and the office for medical director together with examining, dressing rooms, etc., may be more isolated. Where provision can be made for it a small storage room just off the gymnasium, with wide doors would be of great value. It enables the director to keep off the floor any apparatus that may be considered undesirable for certain classes and also serves when room is used for social functions.

SHAPE OF ROOM-

The "ideal gymnasium" varies according to individual views. The proportion of length to width should apporximate three to two. For convenience and arrangement of apparatus, formations of classes, and design of running track this shape serves best.

HEIGHT-

The height of the gymnasium, which is of much importance, should be not less than eighteen feet, nor more than twenty-two feet. It will be understood that this refers to the attaching point of overhead apparatus. Good work is done in many gymnasiums where the ceiling height is of less height, but as a rule it will pay to produce the required height. Besides adding many good and needed

cubic feet of oxygen you adapt the room to the purpose for which it is designed, from a practical working standpoint. A low ceiling gymnasium is about as appropriate as an equally low auditorium.

Where ceiling or truss heights are greater than twenty-two feet it involves dropping down a pipe frame to proper distance. This is always expensive. It certainly is inartistic and seemingly an appendix to what presumably stands for a carefully worked out plan.

TRUSSES-

In designing truss work, and speaking purely for the relation of trusses to apparatus and eschewing any thought in their co-relation to the building proper, the plan shown in Figure (1), is excellent.

The same recommendation would prevail in the location of longitudinal ties or stringers -A-B, C-D- were a gallery or running track installed, providing the gallery was not over six feet wide. In a gymnasium of this size that width of track should not be exceeded, and under no conditions whatever is a gallery or track less than five feet wide to be recommended.

FIXTURES-

Following are some sketches suggesting clamps used in suspending under varying conditions. See2, 3, and 4.

Figure (2) is the simplest, neatest, and best. Seldom, however, do we find sufficient space between angles (one-half inch required), and sometimes there is the space but it is choked by the conduit carrying the electric light wires.

Figure (3) is a common form of clamp used by A. G. Spaulding & Co., for a truss which is concealed and covered with wire mesh and plaster. In planning a gymnasium calling for this construction

it is desirable to have bolts dropped down from the truss and a two inch yellow pine plank bolted to the ceiling before being finished.

Assuming that the maximum height can be observed in providing the overhead point of attachment, the under side of the gallery, where there is one, should be ten feet from the floor. This measurement is given as a desirable minimum.

WINDOWS-

The placing of windows must of necessity depend upon general lighting conditions. It may be pointed out however, that the majority of wall apparatus is attached at points from five to eight feet from the floor; chest weights at five feet, bar stalls at eight. These two types of wall apparatus are used in quantity for class work and allowances should be made for their proper installation. This is seemingly an easy matter when the room is free from running track or gallery, but there have been windows intersected by the running track, and a good arrangement it proved. In this case the lower part of the window only would need to be screened. Ample light is given to the floor, and the running track is equally well cared for. The various games of ball played in modern gymnasiums make it compulsory that the panes be protected.

SKYLIGHTS-

In connection with this feature a broad expanse of glass overhead is not at all desirable. Some of the best gymnasiums so equipped are practically put out of commission in the late spring months on account of the intense heat. Skylights set in a moniter roof have been the ideal method of distributing light in the upper gymnasium.

LOCATION OF HEATING FIXTURES-

The same thought governing the location of windows should prevail in the placing of heating coils. They should do their work

properly but be kept out of the way. Similar precautions should be observed in determining the positions of hot air ducts along the ceiling. Many times the overhead space is so cut into that it is impossible to suspend an adequate amount of apparatus.

FLOORING-

Maple is the preferred wood for the finished floor. All gymnasiums should have a rough and a finished floor. More or less apparatus is frequently guyed to the floor, which must therefore be made to with-stand this upward pull and strain. If one inch of dressed floor is cut away to insert a three-eighth inch thick plate, little is left for screw hold and for these reasons as for many more the perfect floor must be a double floor. The best floor is that with a rough floor of one and a half to two inches thick with a finished floor of one and one-eighth to one inch and a half inch laid over it.

The theoretically and correctly laid floors follow the lines of the walls, forming the design as in Figure (5).

TYPES OF GYMNASIUMS-

There is a differentiation in the treatment of equipments that divides gymnasiums into groups of individual types and makes necessary a corresponding differentiation in the interior design of the building proper. These will be separated or characterized as follows.

Gymnasiums.

1. Athletic recreation Gymnastics.
   a. University
   b. Preparatory School

c. Y. M. C. A.

d. High School

2. Recreation Gymnastics.

a. Armory

b. Club

c. Private

d. Women's Gymnasiums

3. Co-educational Gymnastics.

a. College

b. School

c. Church

d. Public

e. Municipal

4. Playgrounds.

a. Interior Equipment

b. Playground Equipment

a. Divisions of sex and ages

5. Indoor running tracks.

INDOOR RUNNING TRACK-

There is some diversity of opinions expressed among directors on the merits of the running track gallery. However that may be, this feature must be added in gymnasiums of this class as track running events are the principal events of athletic contests and those that certainly require much preliminary training. It is certain that the running track should not be placed in rooms of inadequate size. The minimum size of a room combining gymnastics and athletics with its running track should be 50 feet by 75 feet.

Everything depends on the radius of the track corners or ends. If this is too small it is impossible to design an incline

that will permit high speeds or even comfortable running at any speed. The following table shows the angle of inclination of the track for a speed of 30 feet per second, or, 100 yards in ten seconds, the maximum sprinting speed.

Radius 15 feet	Inclined 62 Degrees
20 "	" 55 "
25 "	" 48 "
30 "	" 43 "
35 "	" 39 "
30 "	" 35 "

As it has not been found practical to make an incline greater than 45 degrees, this table would indicate that 30 feet is the smallest radius desirable for maximum speed.

Athletes are never satisfied with anything short of their best, hence a track to be used by them must be designed for the highest speed.

The concave incline should always be designed especially for the radius and speed required.

SWIMMING POOLS-

The most popular size Swimming Pool, 20 by 60, is shown in plan and section in Figure____. This is called by some the Regulation Size. The A. A. U. Rules require swimming records to be made in a pool "not less than 60 feet in length", and most records are made in pools of this length. This length is also well adapted for water polo. The pool, 75 feet x 25 feet is being used to a great extent in the University Gymnasiums. The depths should be nearly uniform for all expert swimming, record swimming, and polo. The depths shown are suitable for boys and beginners.

The water should be perfectly clear. If it is not natur-

ally clear it should be filtered. The water may be used several times if it is passed through a filter, and alum added to coagulate the albuminoids. Water thus treated may be used over and over again for from four to ten weeks, analysis having shown it to be of sufficient purity.

Heating is best accomplished by passing the water through a closed steam heater which may be done at the same time it is filtered.

First five different methods are shown in Figures 1, 2, 3, 4, 5, for constructing the edge or rim of pools; intended to carry away the drainage from the floor around the pool, scum on the surface of the water, and to provide for expectoration.

A colored stripe on the bottom, about four feet from the edge, serves as a warning to anyone swimming under water that they are near the wall.

The general opinion seems to be that the reenforced concrete is the best building material for pools; but as it is a new material, to both architects and workmen, care should be taken that the work is well designed and thoroughly built.

The lining or finished surface of the pool should be light colored white preferred.

Water in pools is usually kept at a temperature of from 70 to 76 degrees.

The room should be well lighted and have light colored ceiling and walls.

Keep all manner of projecting pipes, rails, ornaments, etc., out of the pool and of its side walls.

Use some approved method of keeping the walls and bottom of the pool water tight.

There are two general types of gymnasium lockers on the market to-day, namely the wood and the steel lockers.

The wood lockers are made of kiln dried white wood, finished with one coat of shellac inside, two coats outside, the latter rubbed between coats. Each door has two iron ventilating panels. The backs may be of wood or wire.

Steel lockers are made in four sizes, 12 and 15 inches wide, also 12 and 15 inches deep. These four sizes are made in four heights, 36 and 42 inches high in two tiers; also 60 and 72 inches high in one tier. This makes 16 sizes of stock lockers. These lockers are built of steel, with sheet metal partitions and door frames of angle steel. All parts are made unusually strong and s stiff. The doors have expanded metal panels and are put together with corner brackets and a lock plate across the center, making them exceedingly strong and rigid. All parts are riveted or bolted in the strongest manner.

BOWLING ALLEYS-

The mild exercise of bowling, particularly well adapted for adults, the social features of the game and its simplicity, all appeal to men seeking recreation after the worry and strain of business, and tend to make the game popular. Good alleys, balls and pins are necessary, and if the best are purchased at the start and given good care, they will last a long time. The alley beds should be of white rock maple, laid in the best manner, on solid foundations designed to avoid the bad effects of heat and moisture, and planed to an absolutely level and smooth surface. After a thorough sandpapering, finishing with No. 1 paper, they are ready for use; if they are to be used with a natural or white finish; or they may be polished.

The white finish is the most satisfactory and uniform to bowl on. The beds are lighter in color and the constant sanding necessary to keep them clean also keeps the bowling surface in the best possible condition.

HEATING-

Steam pipes, radiators or inlets for hot air should only be placed at the ends of alleys. Steam pipes should not pass under or alongside of beds and should not be over them, unless well covered. The beds should be kept at as even a temperature and free from currents of air as possible.

LIGHTING-

Alleys should have a strong light over and in front of the pins and a mild evenly distributed light over the beds. Four or five incandescent lights over the pins and groups of two or three lights placed 10 feet apart over the beds is sufficient. Curtains of White Holland about 1 foot deep and 2 1/2 feet wide, back of each group of lights, will diffuse the light, reflect it evenly on the beds and keep it out of the bowler's eyes.

SPACE REQUIRED-

A pair of regulation alleys require a space 82 feet long and 10 1/2 feet wide, clear of all obstructions; in addition room should be provided for spectators. The foundation may consist of three inches of tar concrete, or cement. The former is preferred on account of its freedom from moisture. The concrete may be omitted if the ground is hard and dry.

IMPORTANT FACTS THAT SHOULD BE TAKEN INTO CONSIDERATION IN DESIGNING GYMNASIUMS.

Space required for each person exercising in classes, etc., 40 sq. ft. of floor surface, not less than 30.

The trusses or ceiling beams should clear the main floor 20 feet; this being the correct height for suspending apparatus. No more than 3 or 4 feet more or less should be used in any case.

A Board 6 or 7 inches wide should be run entirely around the room with the centre 5 feet from the floor, for the support of wall apparatus, Pulley Weights, etc.

The gallery for running track should be 10 or 11 feet clear from the floor. An inclined rail adds to its width. The main floor should be clear of all posts, piers, radiators, etc.

Lights, windows and everything breakable should be protected by strong wire cages or screens.

Estimate (Preliminary). For floor, wall and suspended apparatus from 30 cents to 50 cents per sq. ft. floor surface, according to quality and amount.

Running Track. In 5 ft. wide gallery. Cost of concave inclined floor, laid on rough floors, including flooring corners, $1.50 to $2.00 per running foot. Roberts's (canvas and felt) track, 3 1/2 feet wide $1 per running foot laid.

Lockers. Space required. Allow about 2 1/2 ft. floor space for each 12x12 locker, for aisles, etc., when lockers are in two tiers.

Bowling Alleys. Space required for one pair of regulation alleys, 82 feet long, 10 1/2 feet wide, clear of all obstructions. For a single alley, 5 feet 4 inches in width.

Foundation may be concrete (tar or cement), or firm loam or gravel.

Estimate, (Preliminary). Standard alleys per pair $700, including furniture.

BIBLIOGRAPHY.

1. Brickbuilder - Vol. 18 - No. 2,3,4,5,and 6.

Princeton Gymnasium

Northwestern Gymnasium

Chicago University Club

Cincinnatti Gymnasium

Philips Academy Gymnasium

Data obtained through the courtesy of the Narragarset Machine Co.

Data obtained through the courtesy of A. G. Spaulding & Co.

Tabulation.

GYMNASIUMS.

	Floor Measure	Floor Area
#Princeton University Gymnasium	167 ft. x 101 ft.	16,867 sq. ft.
Cincinnatti Gymnasium and Athletic Club	103 ft. x 67 ft.	6,901 " "
Florida Agricultural College	80 " x 40 "	3,200 " "
Radcliffe College	97.5 ft. x 50 ft.	4,875 " "
Morgan Park Gymnasium	72 ft. x 40 ft.	2,880 " "

#Largest Gymnasium floor in the world.

DRAWINGS SUBMITTED.

Sheet I. Floor Plans.

Sheet II. Plan of building and Athletic Field.

Sheet III. Main Elevation.

Sheet IV. Side Elevation and Section.

SCHEDULE OF ROOMS.

MAIN FLOOR.

No.	Room.	Dimension	Floor Area
2.	Entrance Vestibules	104 ft. x 18 ft.	1,872 .
2.	Main Foyers	104 " x 104 "	10,816
	Main Gym. Floor	284 " x 172 "	48,848
	Basket Ball Floor	144 " x 96 "	13,824
	Hall of Exercise	144 " x 96 "	13,824
	Hall of Games	144 " x 96 "	13,824
	Trophy Room	118 " x 40 "	4,720
	Tennis Court	118 " x 40 "	4,720
	Bowling Alleys	118 " x 40 "	4,720
	Athletic Director	36 " x 30 "	1,080
	Athletic Manager	36 " x 30 "	1,080
	Team Manager	36 " x 30 "	1,080
	Foot-ball Coach	30 " x 22 "	660
	Store Room	36 " x 30 "	1,080
	Athletic Ass. office	36 " x 30 "	1,080
	Medical Exam. Room	36 " x 30 "	1,080
	Baseball Coach	30 " x 22 "	960
	Track Coach	34 " x 16 "	544
	Miscellaneous Coaches	34 " x 16 "	544
3.	Passage Way	34 " x 9 "	306
	Toilet	33 " x 9 "	297
	Corridor	144 " x 30 "	4,320
	Retiring Room	34 " x 16 "	544
	Tennis Locker Room	34 " x 16 "	544
	Locker Room	34 " x 16 "	544

MAIN FLOOR.

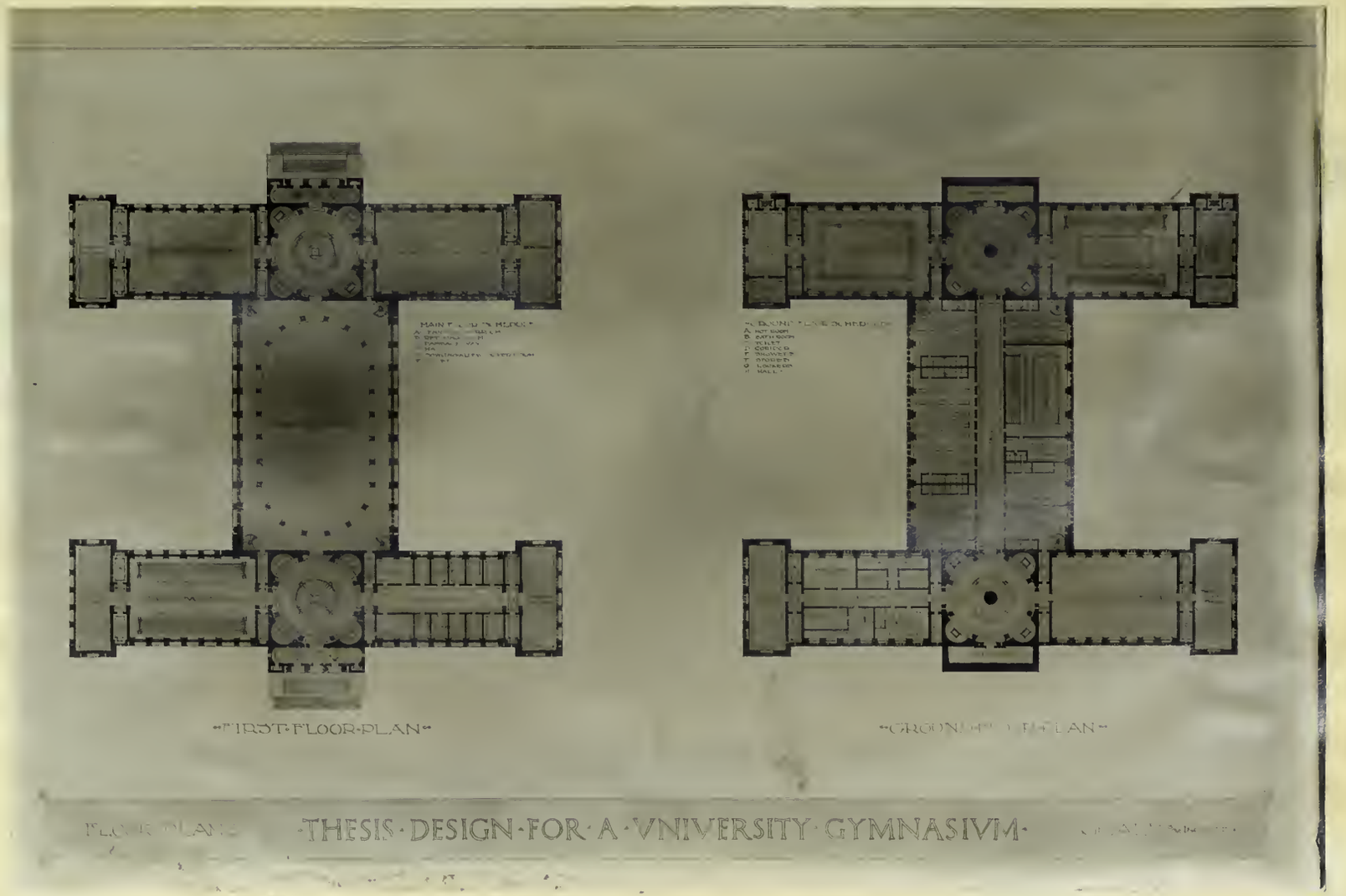
No.	Room.	Dimension	Floor Area
	Locker Room	34 ft. x 16 ft.	544
	Retiring Room	34 " x 16 "	544

GROUND FLOOR.

No.	Floor Dimensions		Area
12.	Foyers	104 ft. x 104 ft.	10,816
	Main Pool Room	144 " x 96 "	13,824
	Polo Pool Room	144 " x 96 "	13,824
	Baseball Dirt Floor	144 " x 96 "	13,824
	Boxing and Fencing	118 " x 40 "	14,720
	Varsity Team Room	40 " x 76 "	3,040
	Visiting Team Room	40 " x 76 "	3,040
	Rubbing Rooms	40 " x 28 "	1,120
	Main Locker Room	284 " x 68 "	19,312
	Swimming Team Lockers	68 " x 48 "	3,264
	Crew Room	104 " x 68 "	7,072
	Crew Lockers	68 " x 30 "	2,040
	Faculty Lockers	68 " x 48 "	3,264
	Class Team Lockers	68 " x 48 "	3,264
2.	Toilets	9 " x 9 "	81
2.	Store Rooms	9 " x 9 "	81
2.	Store Rooms	96 " x 20 "	1,920
4.	Bath Rooms	32 " x 16 "	512
3.	Hot Rooms	32 " x 16 "	512
	Squash and Racket-Team Lockers	32 " x 16 "	512
4.	Corridors	34 " x 9 "	306

GROUND FLOOR.

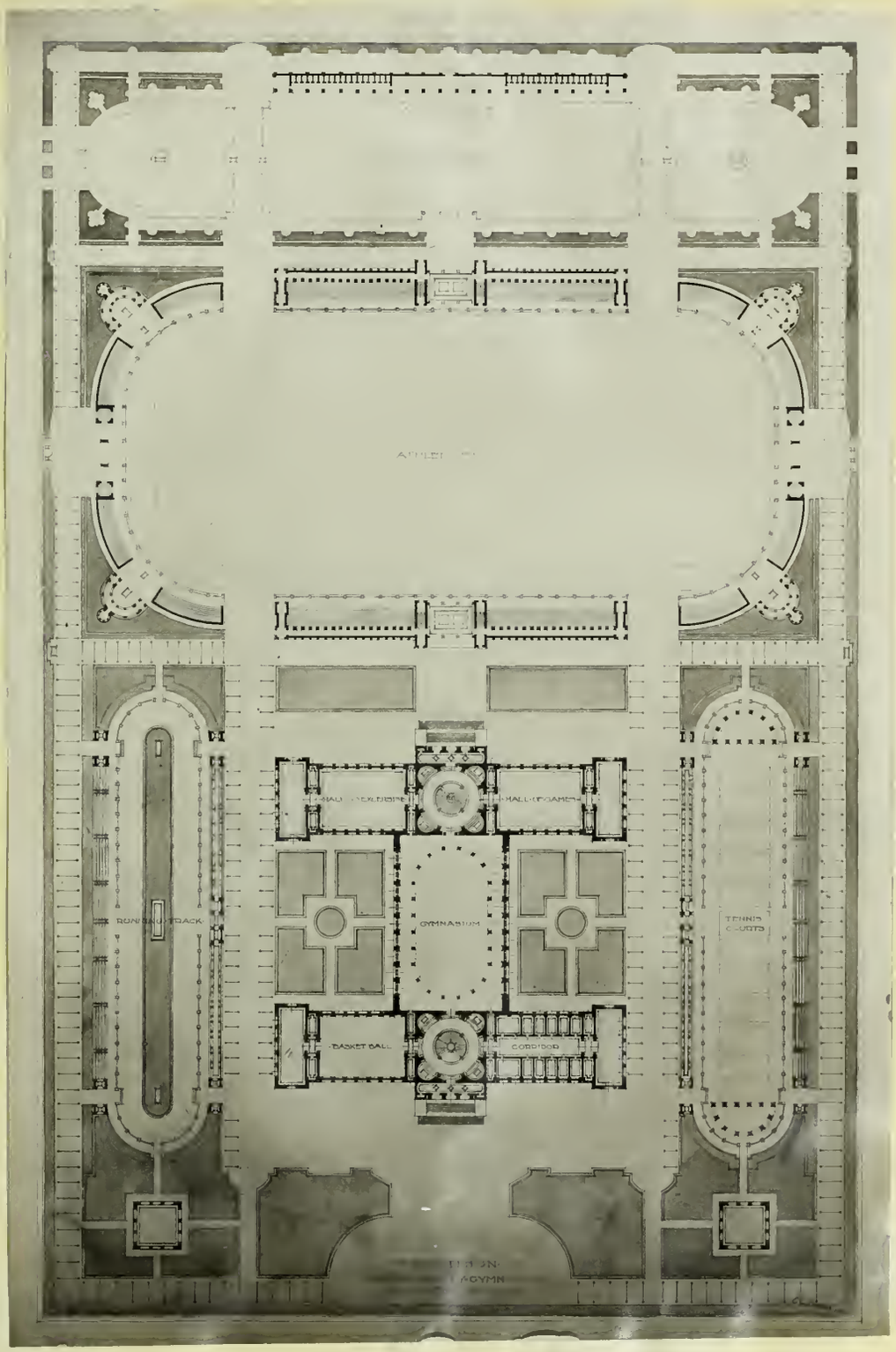
No.	Room.	Floor Dimensions	Area
4.	Toilets	32 ft. x 9 ft.	288
	Wrestling Room	60 " x 36 "	2160
2.	Squash Courts and Lockers	80 " x 36 "	2880
1.	Raquet Court and Lockers	80 " x 36 "	2880
1.	Corridor	144 " x 20 "	2880
	Special Locker Room	60 " x 36 "	2160



"FIRST·FLOOR·PLAN"

"GROUND·FLOOR·PLAN"

FLOOR PLANS ·THESIS·DESIGN·FOR·A·VNIVERSITY·GYMNASIVM·


GYMNASIUM
BASKET BALL
CORRIDOR

THESIS DESIGN FOR A VNIVERSITY GYMNASIVM


SIDE ELEVATION
THESIS DESIGN FOR A VNIVERSITY GYMNASIVM
LONGITUDINAL SECTION

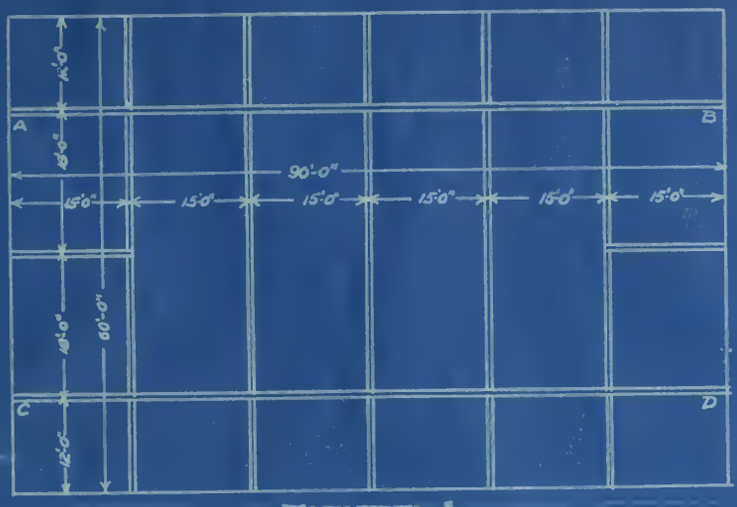


FIGURE 1.

FIGURE 2.

FIGURE 3.

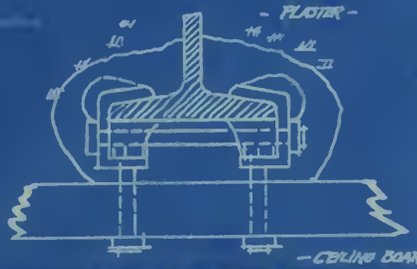


FIGURE 4.

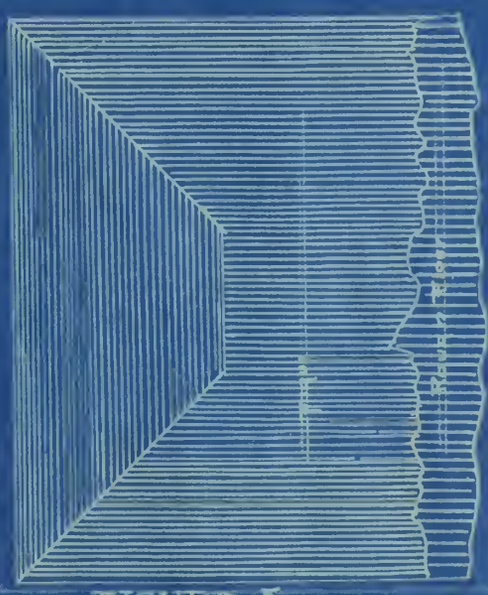


FIGURE 5.

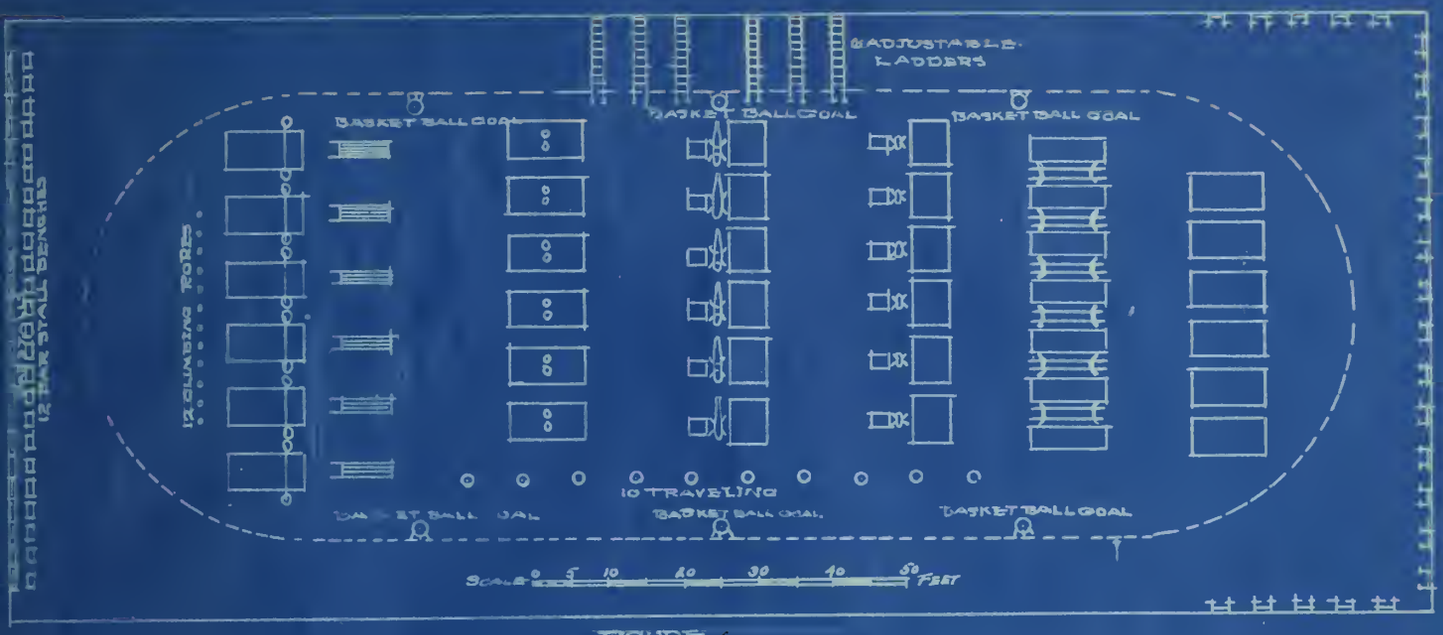


FIGURE 6

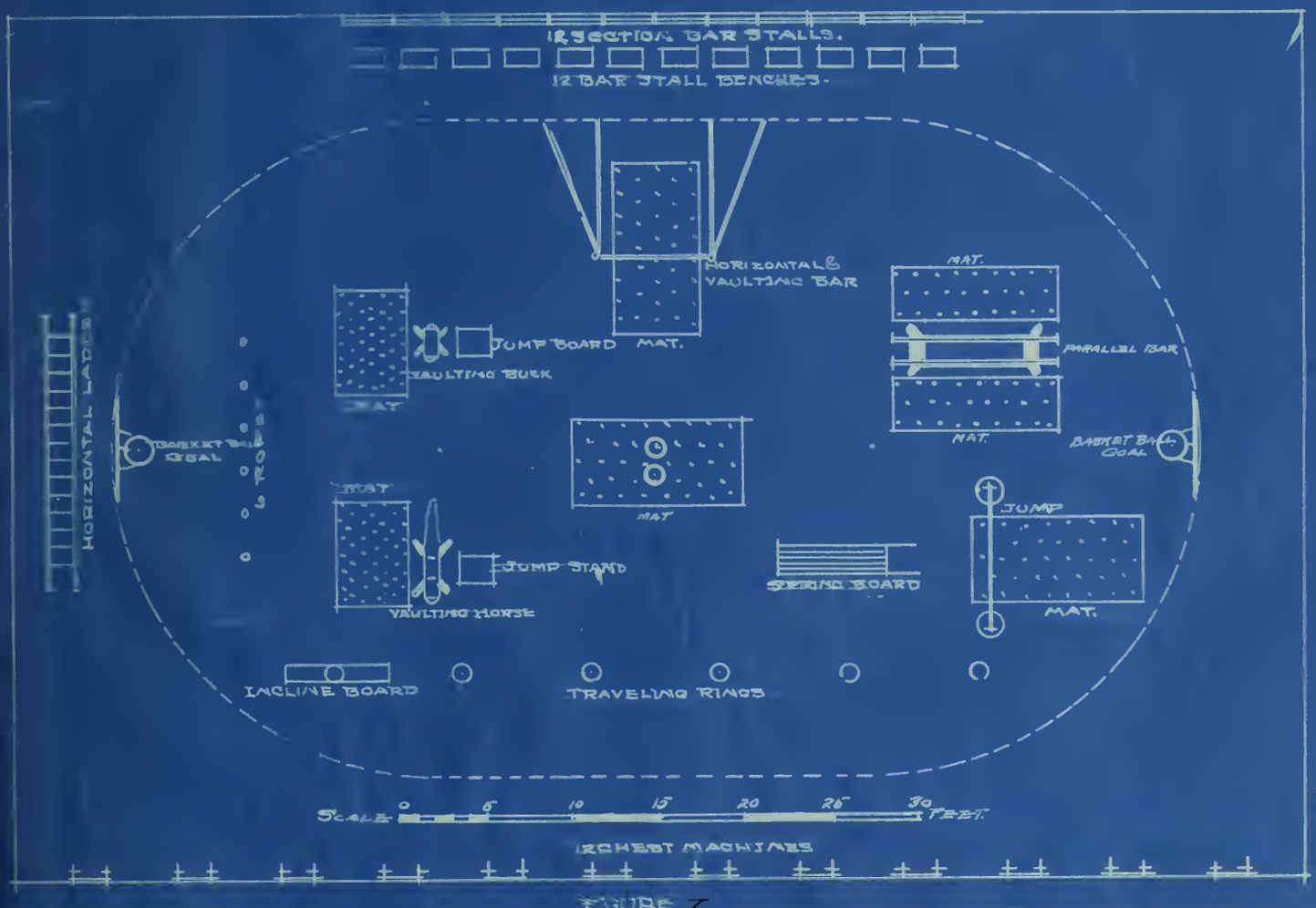


FIGURE 7

EQUIPMENT FOR A GYMNASIUM - 50' X 75' & 80' X 190'.

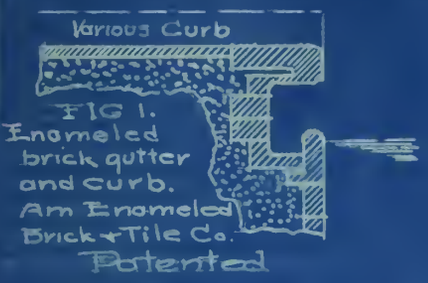


FIG 1.
Enameled brick gutter and curb.
Am Enameled Brick + Tile Co.
Patented

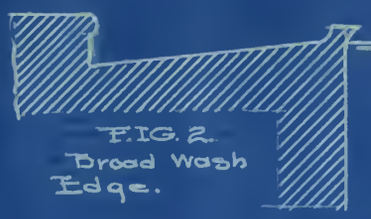


FIG. 2.
Broad Wash Edge.

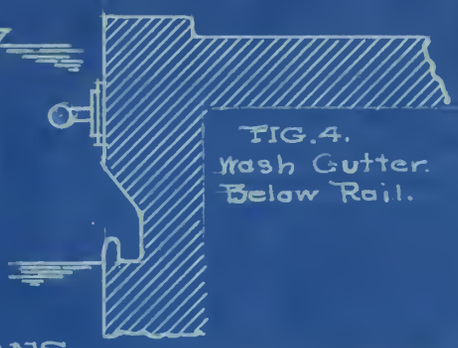


FIG. 4.
Wash Gutter Below Rail.

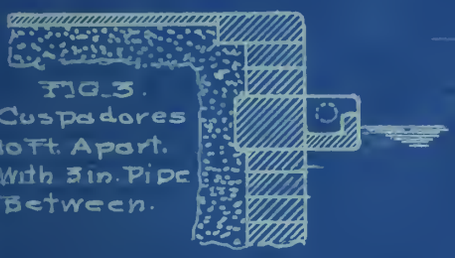
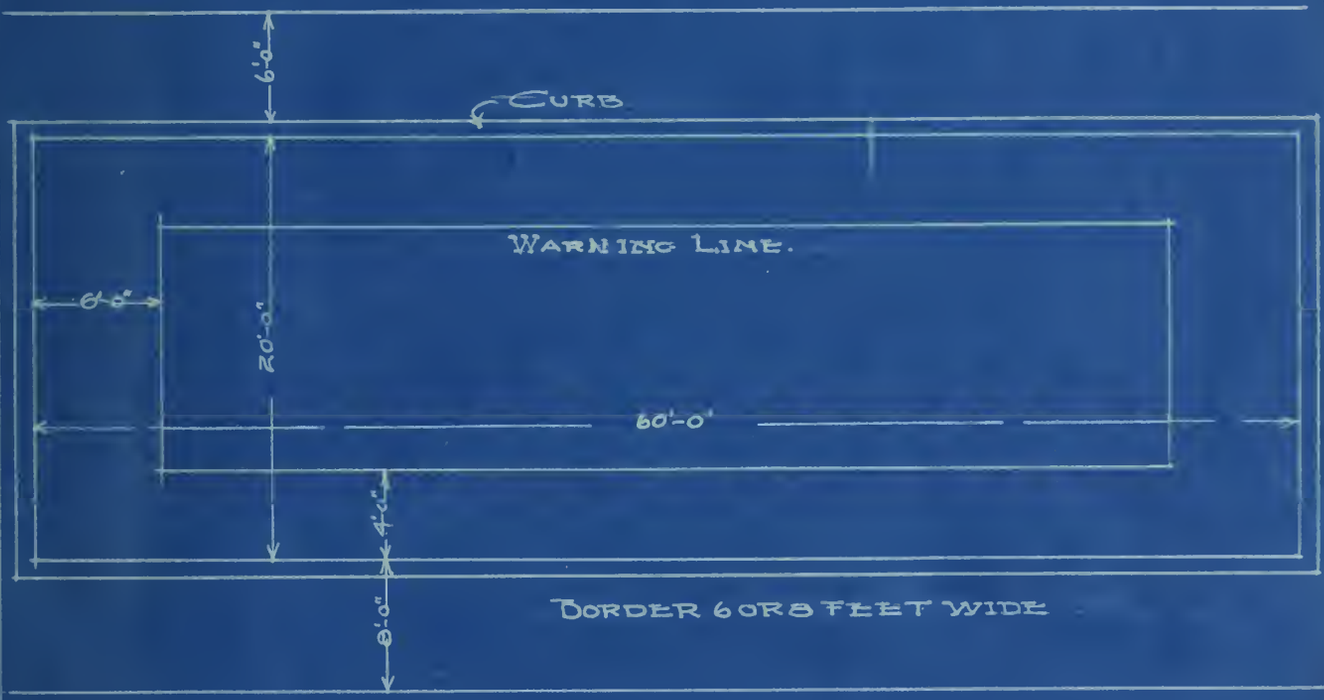


FIG. 3.
Cuspadores 10 ft. Apart. With 3 in. Pipe Between.

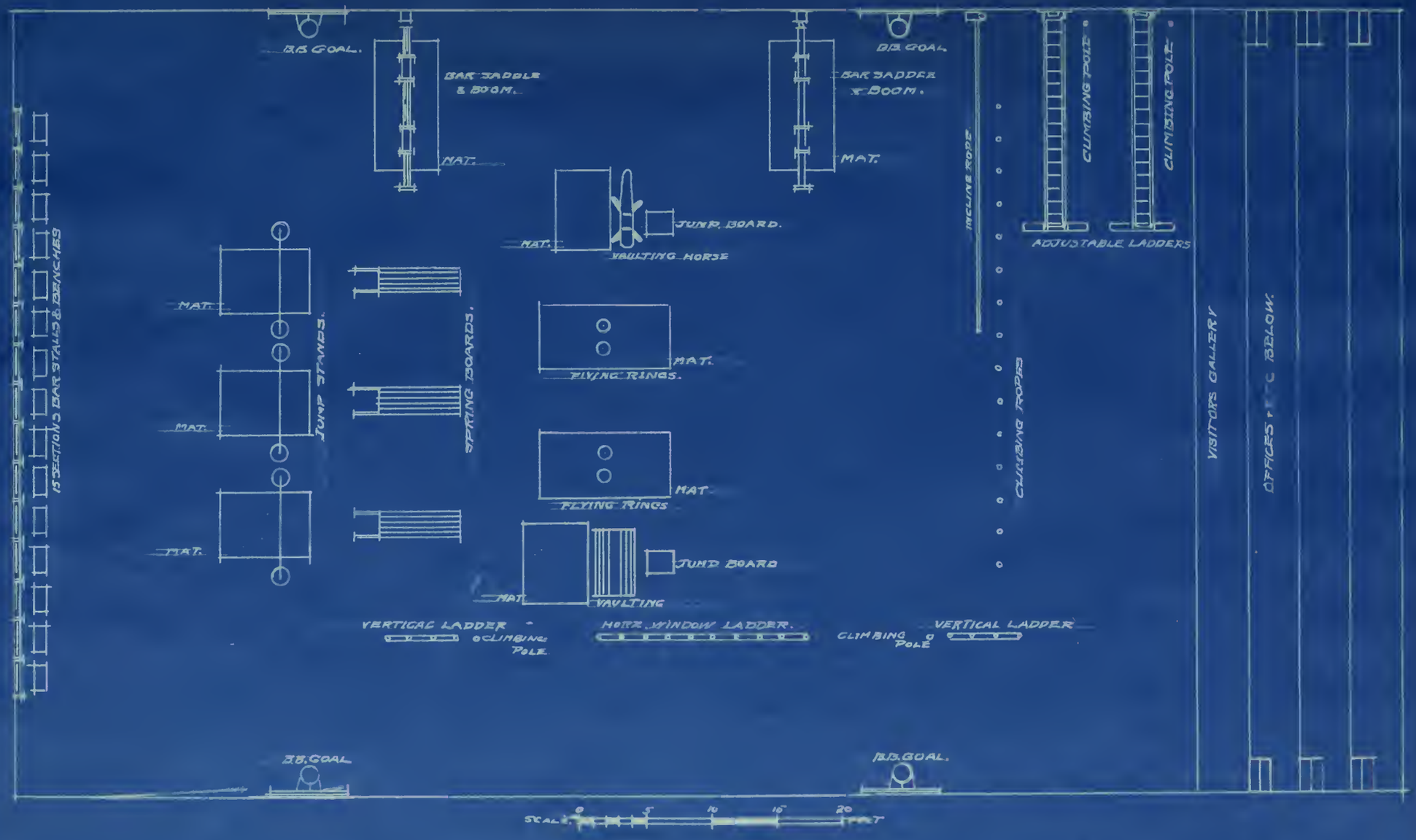
EDGE SECTIONS. OF SWIMMING POOLS.

FIG. 5.
Narrow Edge Gutter.

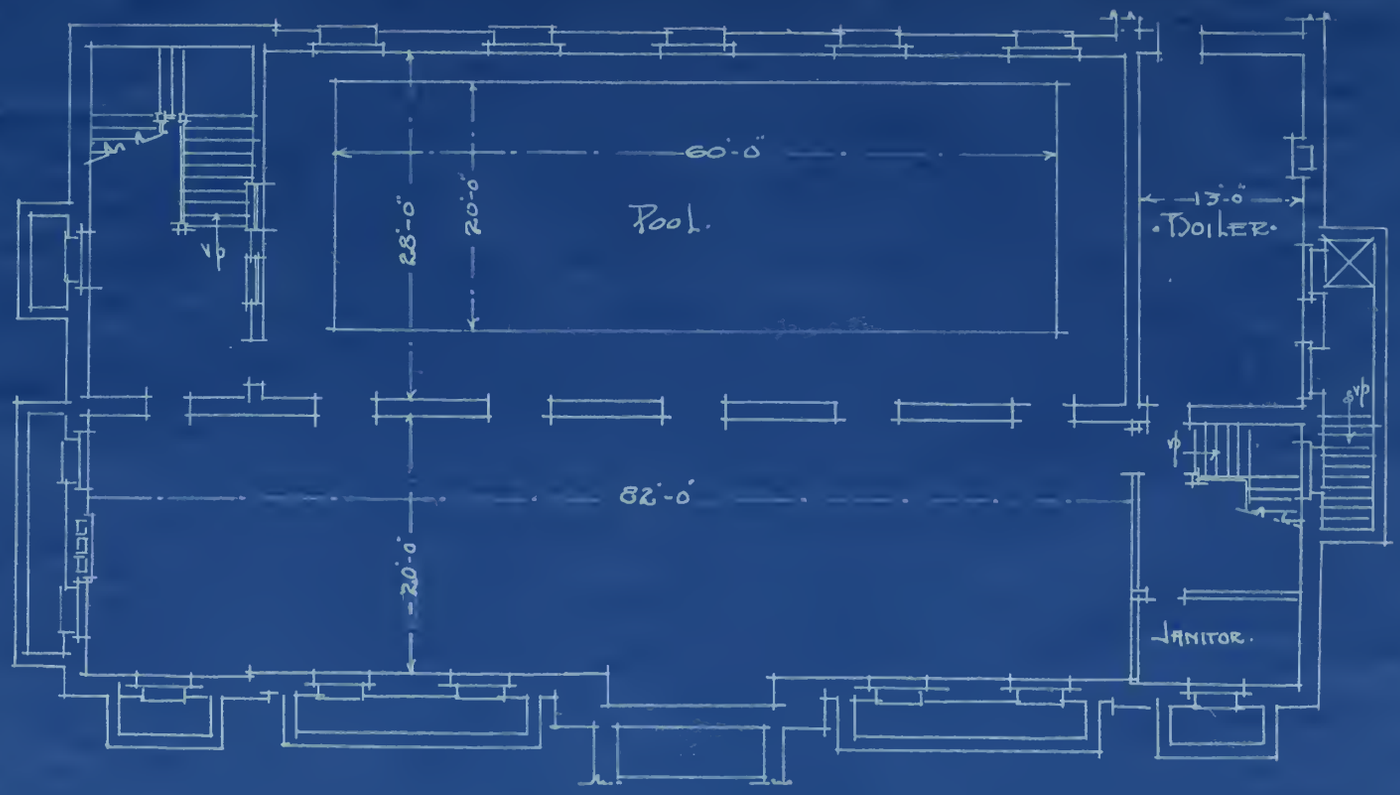
Asphalt.



PLAN AND SECTION OF SWIMMING POOLS.



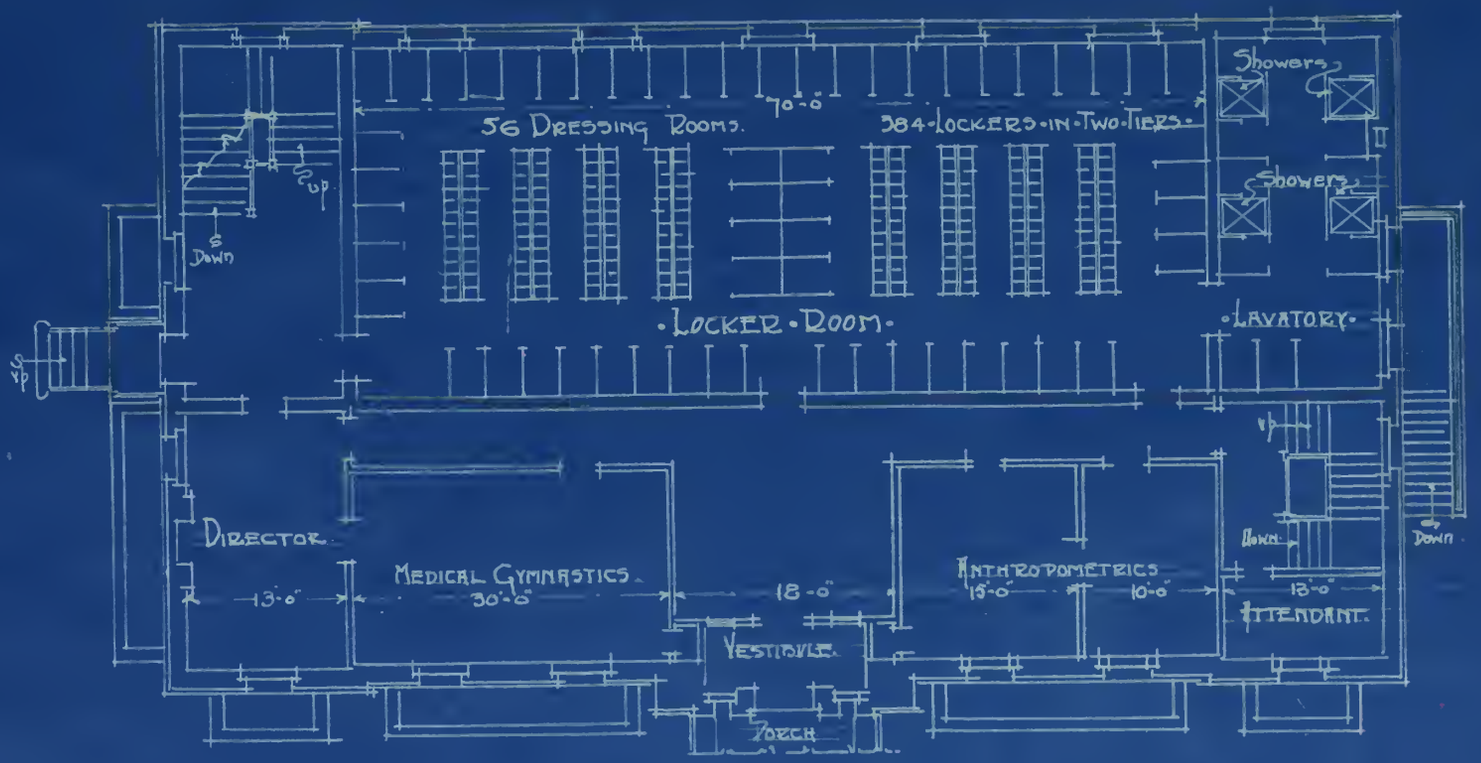
A WOMENS GYMNASIUM



Basement Floor Plan.

Radcliffe College Gymnasium.

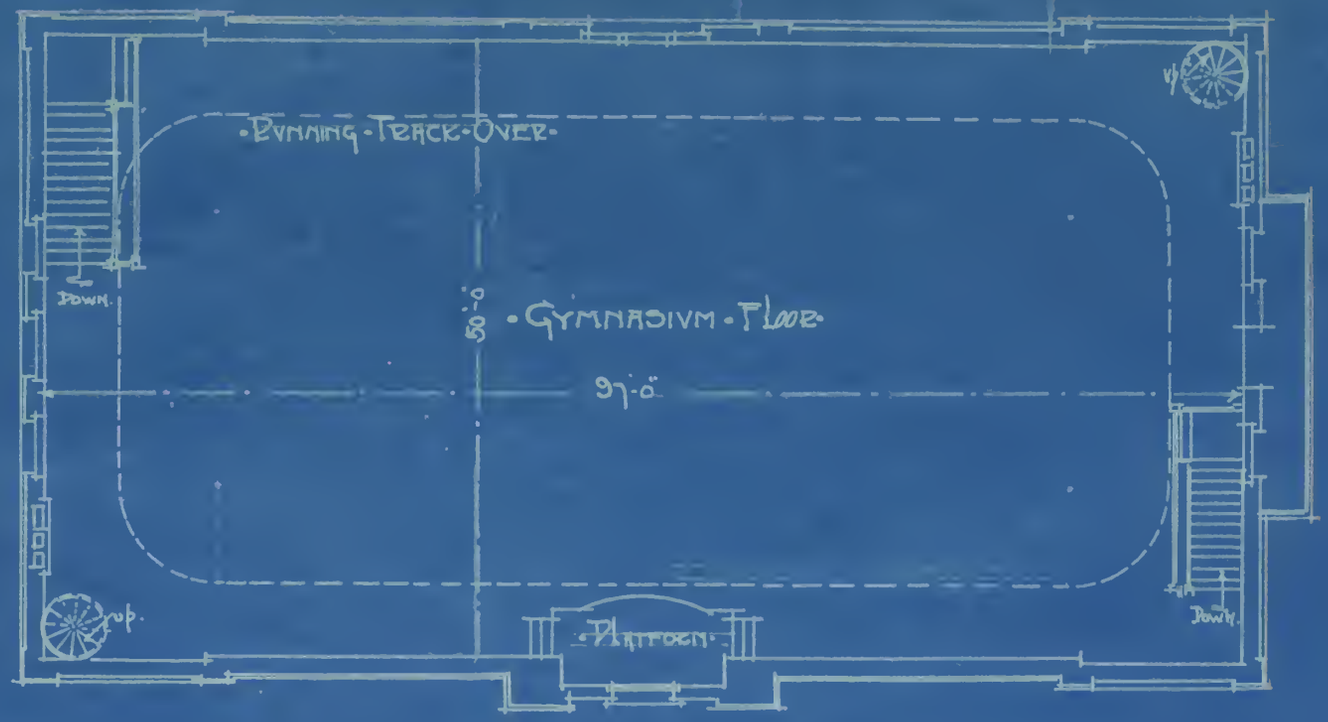
Mc Kim Mead and White Arch'ts.



First Floor Plan.

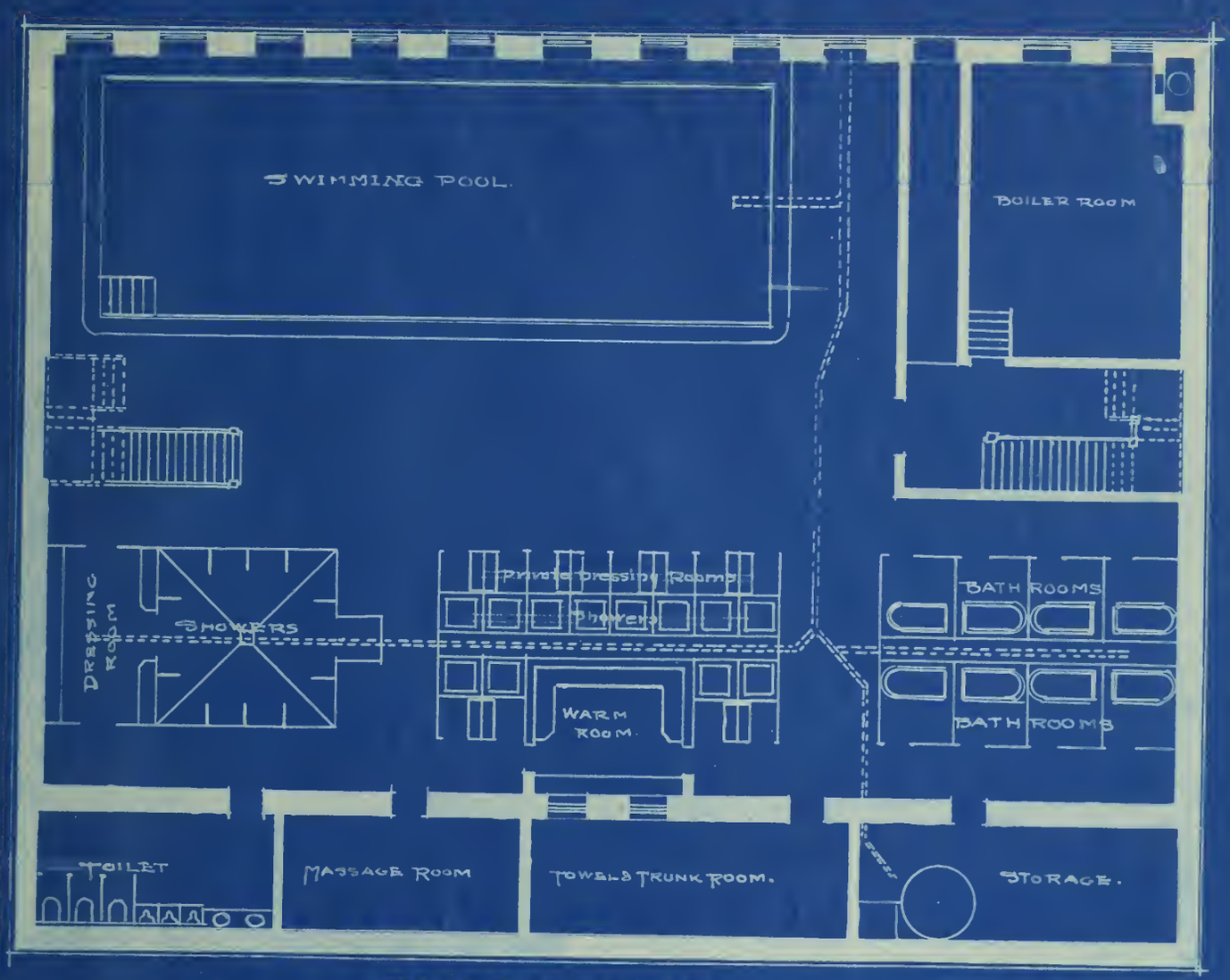
Radcliffe College Gymnasium.

McKim, Mead and White Archt's.

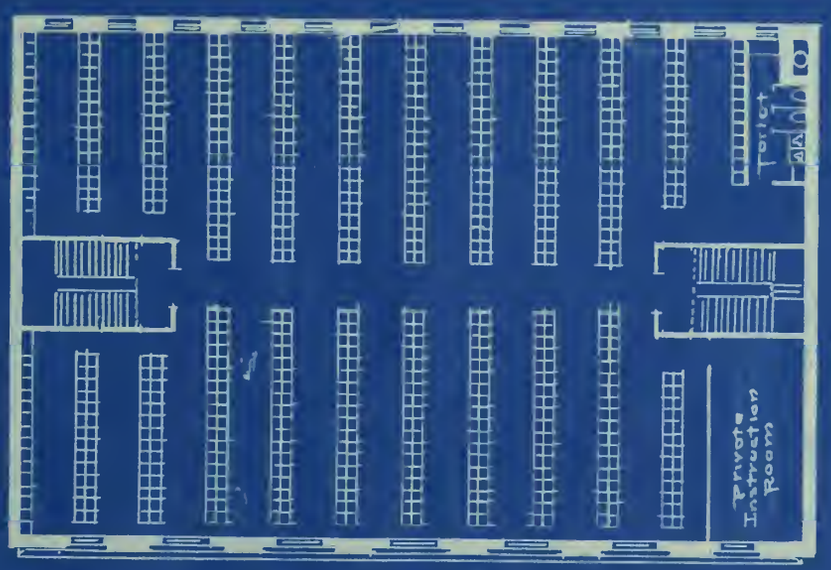


Second Floor Plan

Radcliffe College Gymnasium
McKim Mead and White Archts

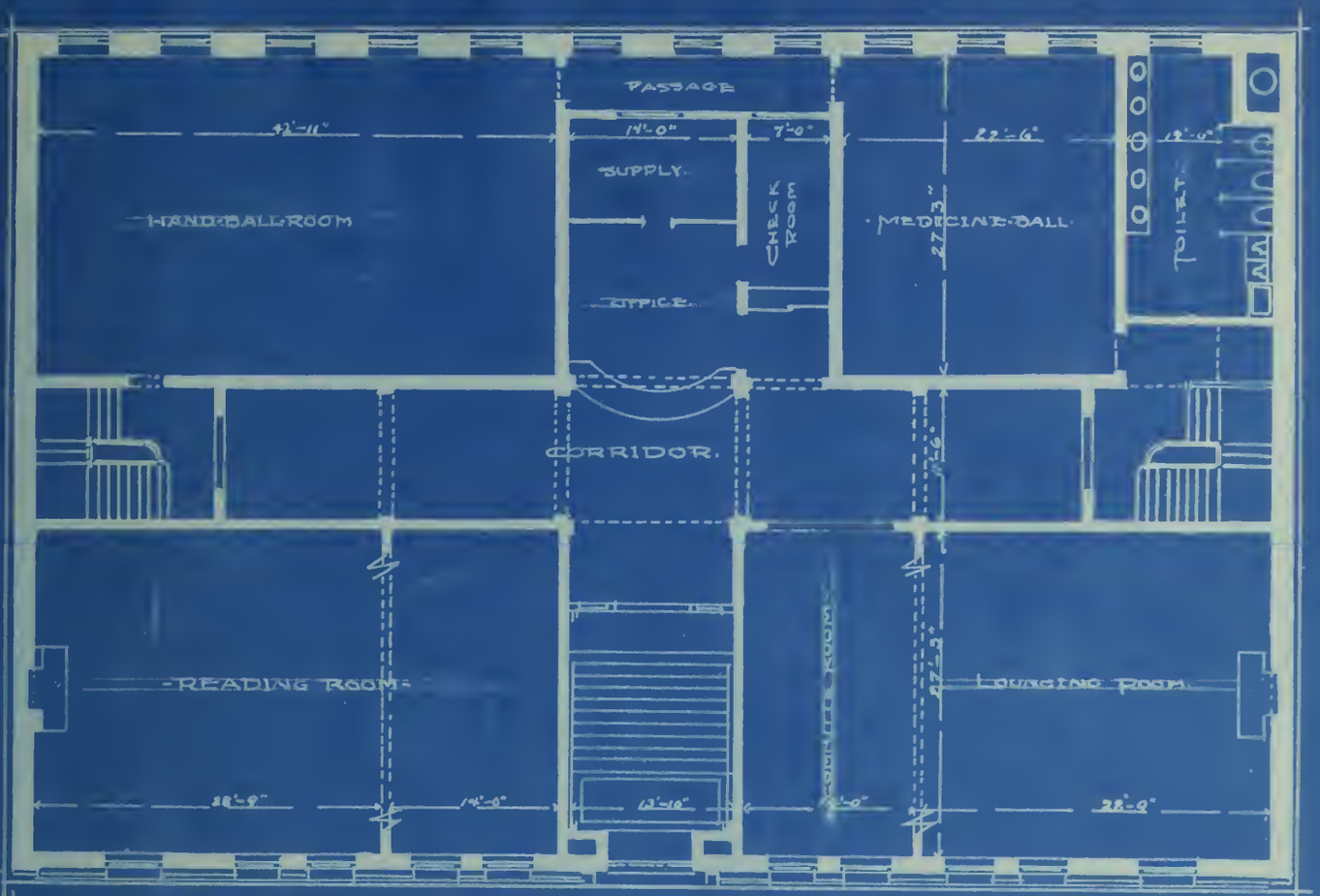


BASEMENT PLAN



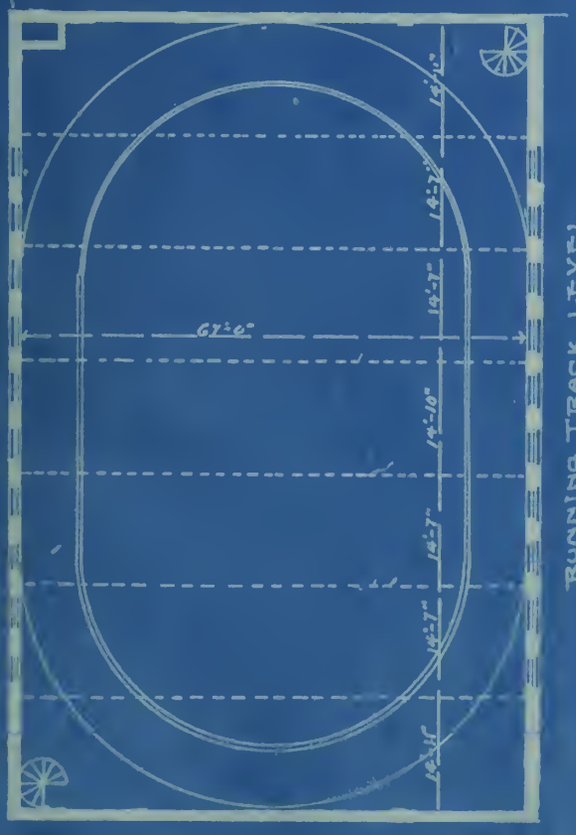
LOCKER ROOM FLOOR

CINCINNATI GYMNASIUM AND ATHLETIC CLUB

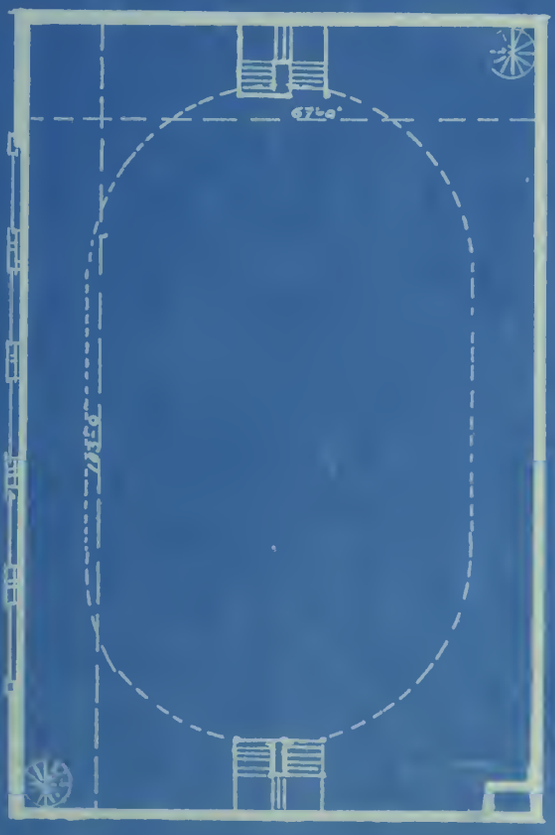


FIRST-FLOOR-PLAN

105'

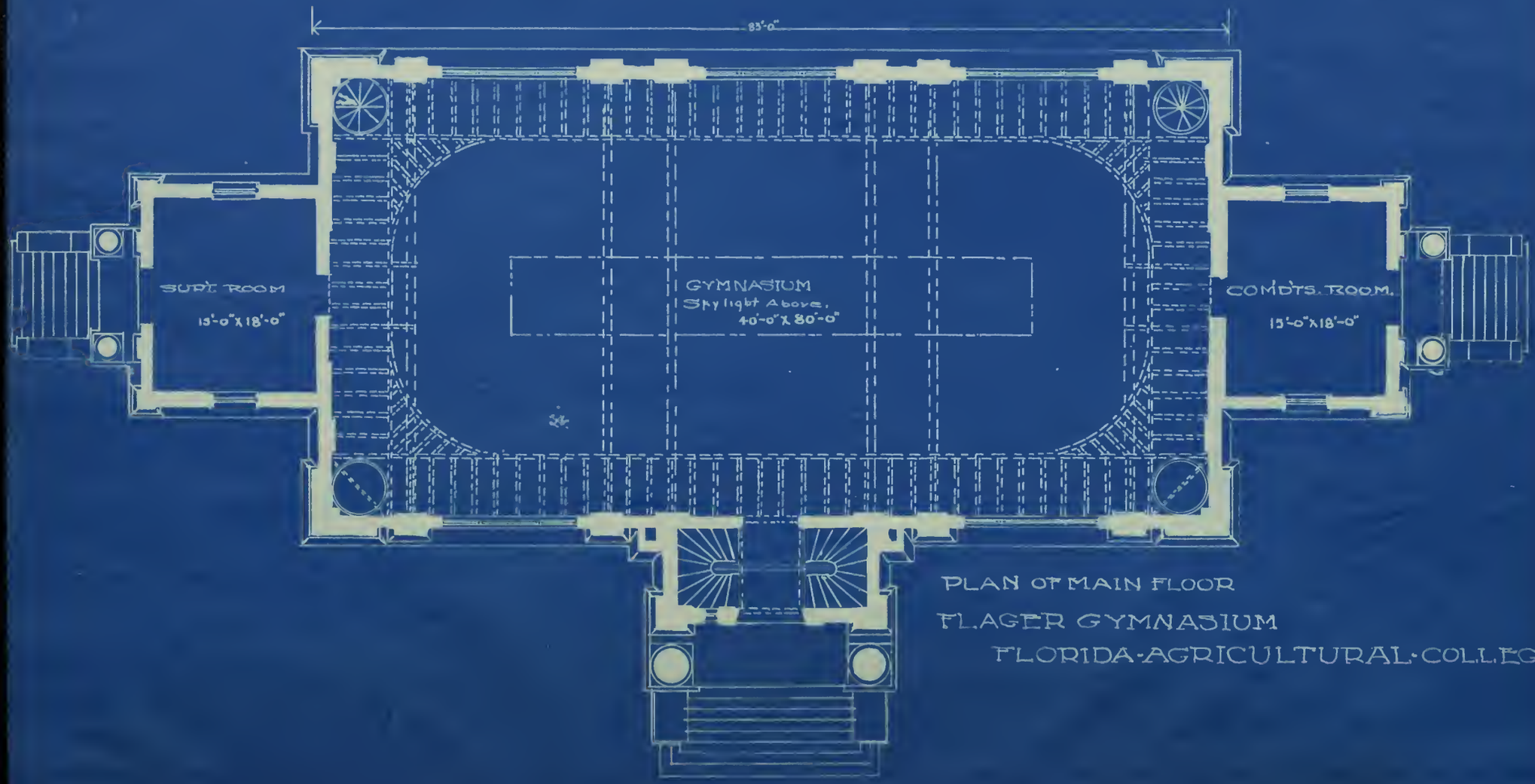


RUNNING TRACK LEVEL



GYMNASIUM FLOOR.

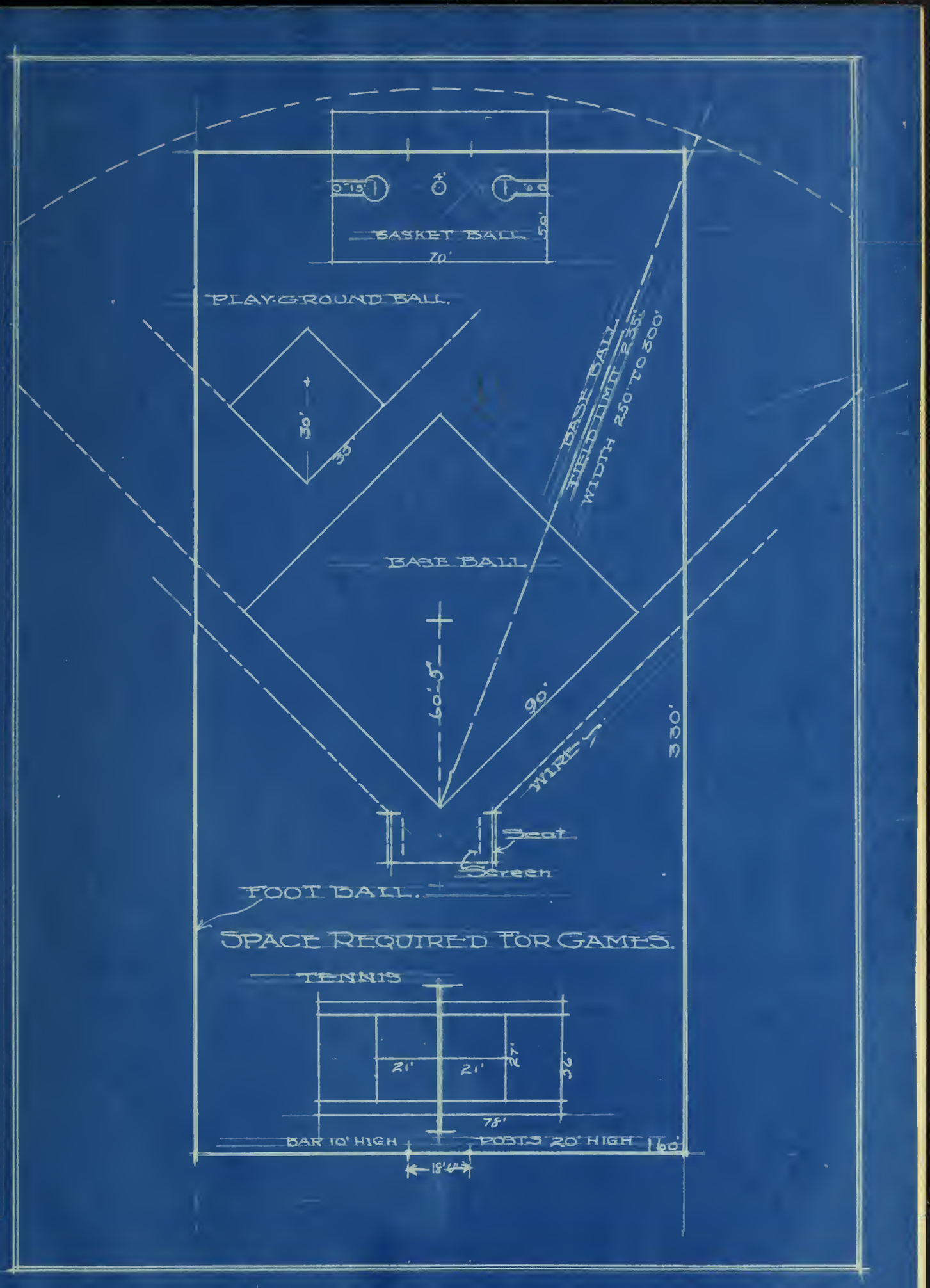
CINCINNATI GYMNASIUM AND ATHLETIC CLUB.

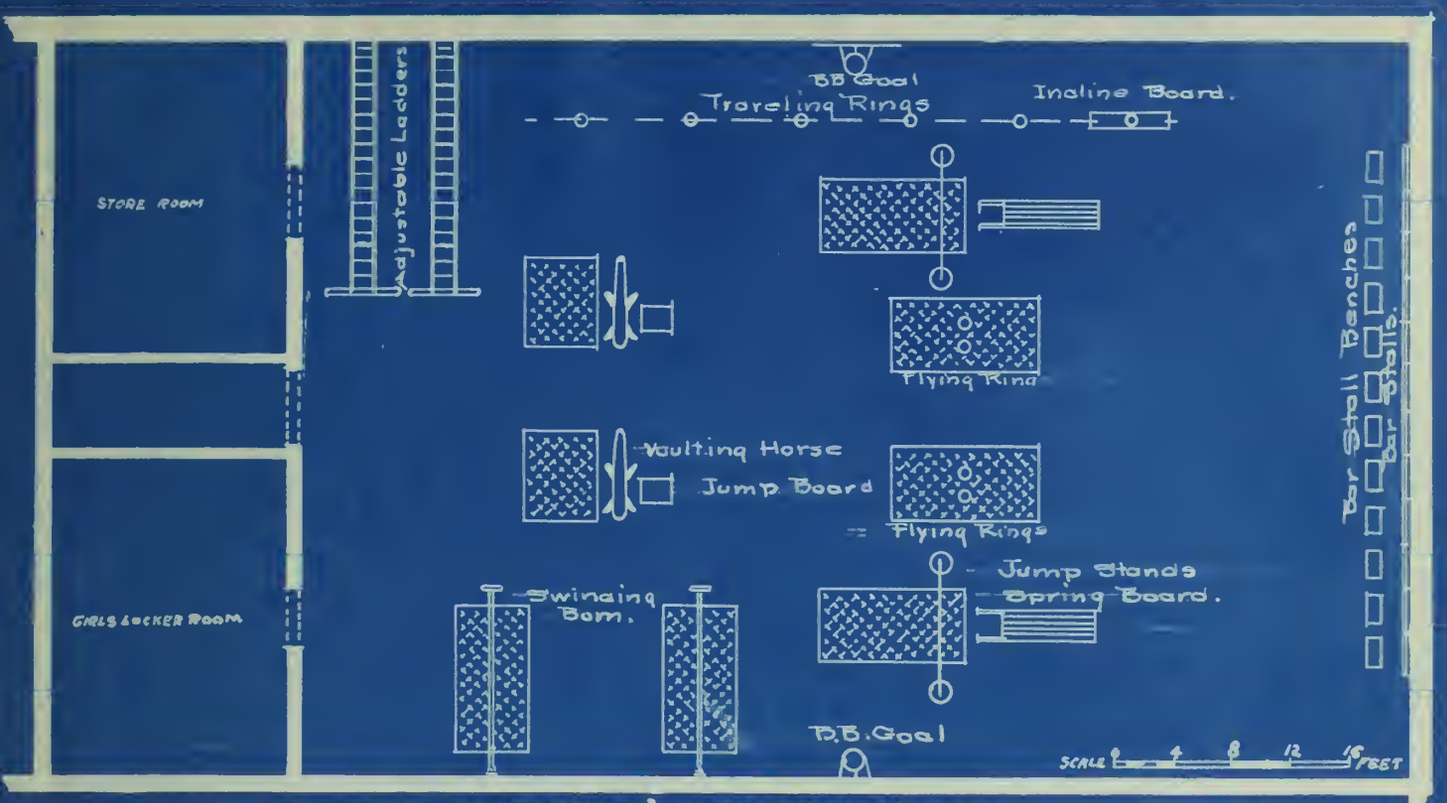


PLAN OF MAIN FLOOR

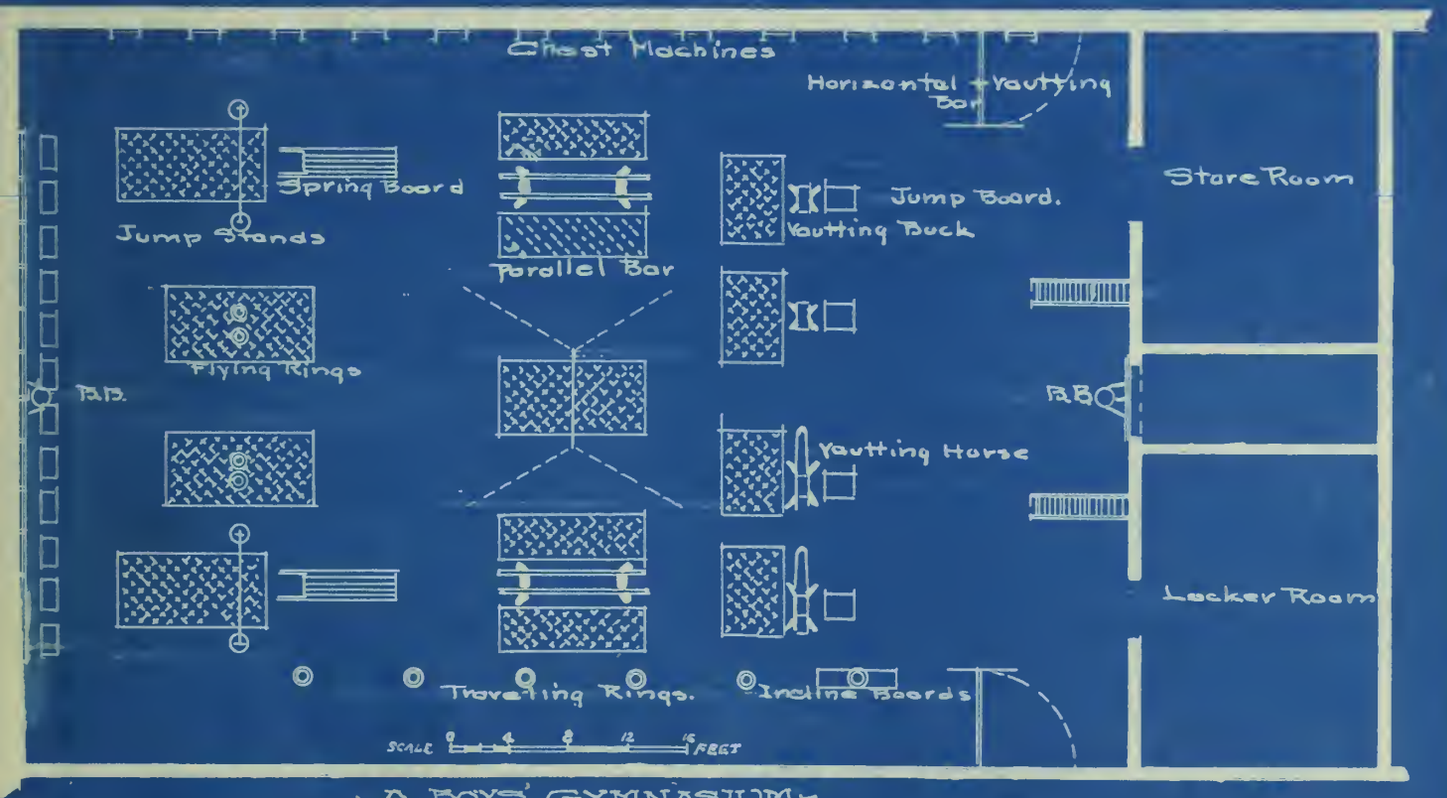
FLAGER GYMNASIUM

FLORIDA-AGRICULTURAL-COLLEGE

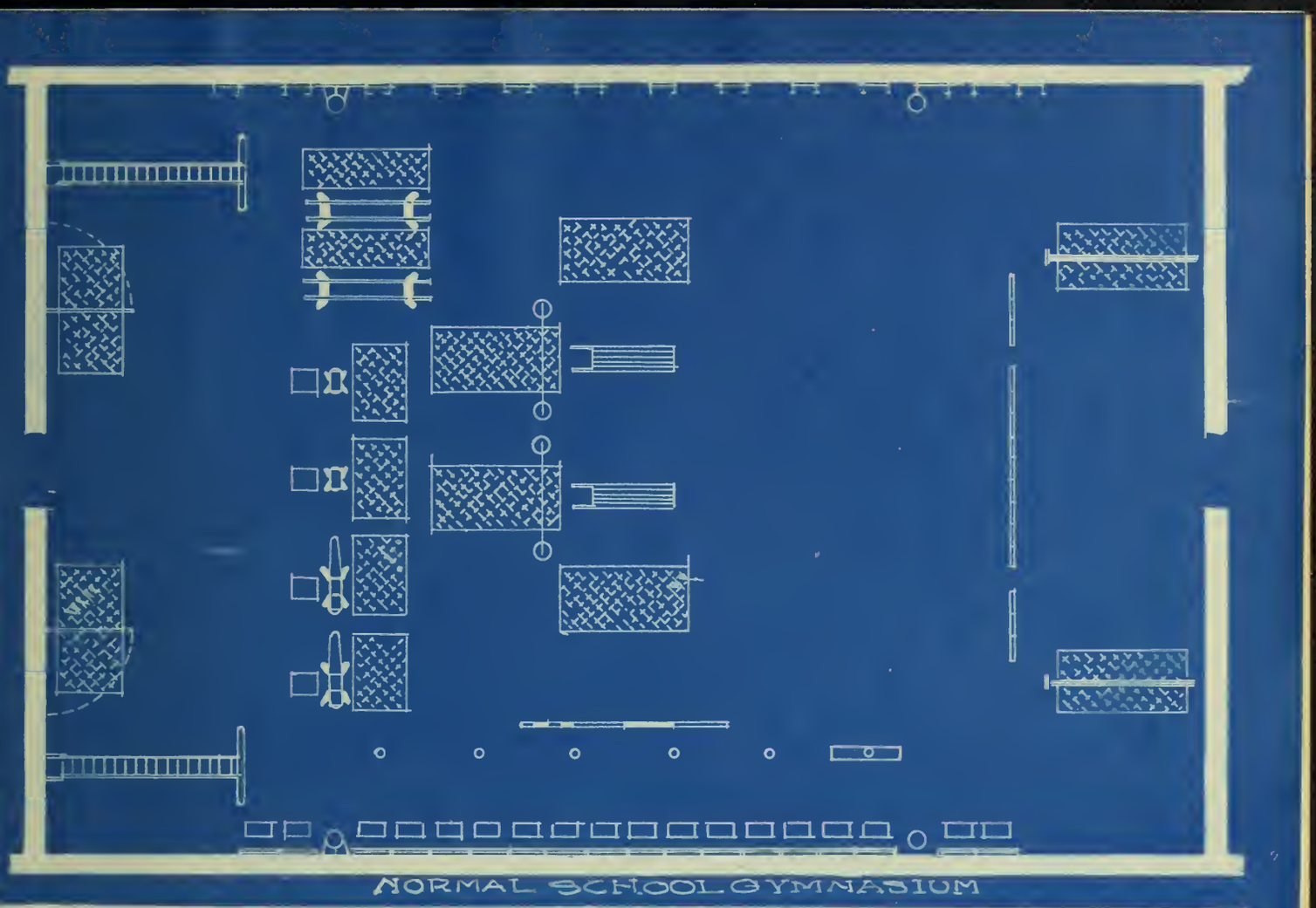

BASKET BALL
70'
50'
PLAY-GROUND BALL.
30'
35'
BASE BALL
FIELD LIMIT 235'
WIDTH 250' TO 300'
BASE BALL.
60'-5"
90°
330'
WIRE
Seat
Screen
FOOT BALL.
SPACE REQUIRED FOR GAMES.
TENNIS
21'
21'
27'
36'
78'
BAR 10' HIGH
POSTS 20' HIGH
60'
18'-6"



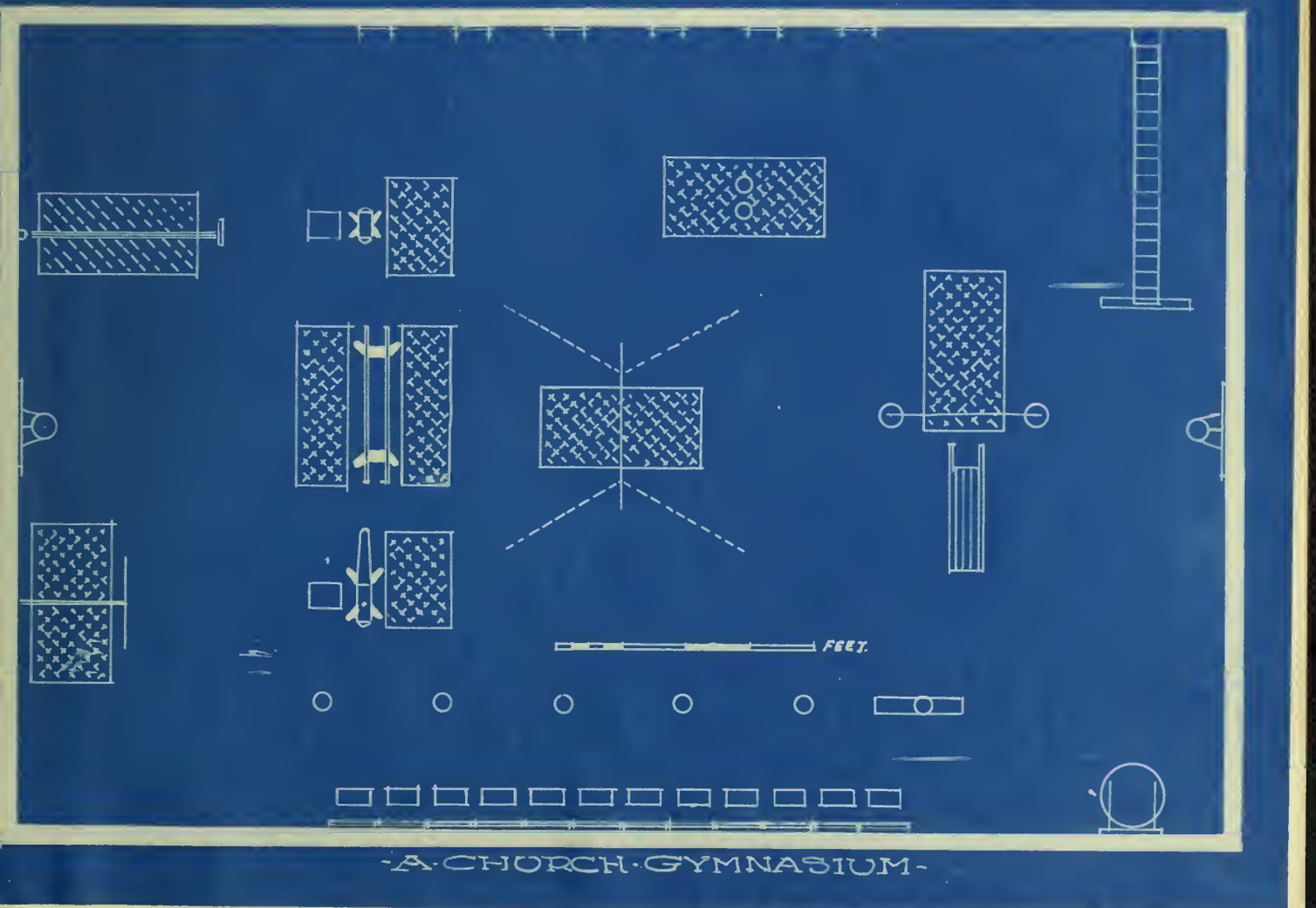
A GIRLS' GYMNASIUM



A BOYS' GYMNASIUM



NORMAL SCHOOL GYMNASIUM



-A-CHURCH-GYMNASIUM-